

current power line is similar, but may continue to be felt as long as contact with the object is maintained.

The magnitude of an induced voltage depends on the voltage of the transmission line, distance from the conductor, size or length of the object, and its orientation to the line. Shocks caused by an induced voltage do not usually present a hazard; for this reason we refer to them as nuisance shocks. However, mitigation methods to remove the possibility of hazards are identified in sections of the booklet that follow.

Irrigation Systems

All types of irrigation systems have been operated safely near BPA power lines for years. Nonetheless, caution should be used in storing, handling, and installing irrigation pipe, and in operating spray irrigation systems near power lines.

Irrigation pipe should be moved in a horizontal position under and near all power lines to keep it away from conductors overhead.

Again, we stress that the one critical hazard from overhead lines is the danger of bringing an object — in this case, a length of irrigation pipe — into close proximity to a conductor. One purpose of this booklet is to repeatedly make this warning.

As a precautionary measure, equipment used to install irrigation systems should be kept away from transmission lines. If you wish to, contact one of BPA's regional offices about your particular situation. If you are working near a line, it is wise to supplement normal precautions by assigning one person to act as a "safety watcher." This person simply stands by, watches, and warns the other workers against unsafe moves.

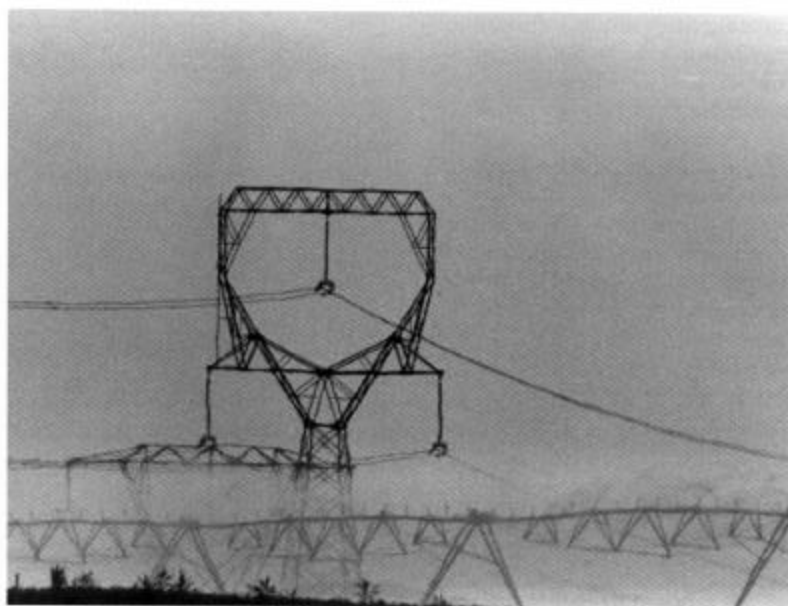


Irrigation pipe should be moved in a horizontal position under and near all power lines to keep it away from the conductors overhead.

Great caution should be used when moving a high-pressure irrigation system under a transmission line. The small wheel bases of some of these systems tend to make them unstable. If one should tip while under a line, its boom could be lifted into a conductor.

You may notice some nuisance shocks when unloading irrigation pipe near a transmission line. It can be reduced greatly or eliminated entirely by unloading the pipe at least 50 feet away from the line. This also tends to reduce the risk that the pipe will get too close to the conductors. Even if pipe stacked on a rubber-tired vehicle is unloaded under a transmission line, the possibility of nuisance shocks can be eliminated by grounding. The grounding is done by clipping one end of a wire to a metal rod driven into the ground and the other end to a pipe on the bottom of the stack.

All types of irrigation systems, including center pivot systems, can be operated safely near or on a right-of-way. However, irrigators should avoid situations where a



Irrigation around BPA lines is safe when proper precautions are taken on the rights-of-way.

solid stream of water can come in contact with a conductor, even if the possibility is remote. Should this occur, a person in contact with the irrigation system, or standing very near it, say 5 feet or so, may receive a severe shock. When asked, BPA will provide assistance as to the proper

installation or operation of an irrigation system to avoid hazardous situations.

If a sprinkler malfunctions and a solid stream of water reaches a conductor, turn off the water at its source — by switching off the pump — before attempting to correct the problem.



The possibility of nuisance shocks can be eliminated by grounding metal pipe when unloading near BPA lines.

All nozzle risers in the vicinity of a transmission line should be equipped with spoilers or automatic shutoffs. This will prevent a solid stream from striking a conductor if a nozzle breaks or falls off.

Equipment with smaller diameter or fine mist spray nozzles do not usually present a problem. Ordinarily, a broken spray will not conduct a significant amount of current. However, spray containing fertilizer is much more conductive. Therefore, additional precautions should be taken to avoid spraying water with fertilizer into contact with transmission line conductors.

High-volume irrigation systems which use large nozzles and high pressure to sprinkle big areas are of special concern. Nozzle diameters vary from 3/4 inch to 1-15/16 inches and water pressures range from 80 to 100 psi. Thus, a solid stream discharged from one of these nozzles may reach heights of 30 to 35 feet and go as far as 200 feet. When such a system is in operation, a safe distance must be kept between it and a transmission line. If requested, BPA will gladly help you determine what a safe distance is for your equipment. Contact the nearest BPA regional office, listed on page 1, if you want help.

Nuisance shocks may be experienced when touching mobile pipe-type and wheel-type irrigation systems located near transmission lines. These shocks can occur when soil conditions are dry and there is a long section of irrigation pipe parallel to and within 15 meters (50 feet) of the transmission line centerline. Simple grounding procedures can prevent nuisance shocks on these types of systems. Contact BPA for assistance or information about your particular situation.

Central pivot circular irrigation systems installed near or under transmission lines can develop hazardous shock

potentials during operation and maintenance. To eliminate these hazards:

- Provide a good electrical ground for the pivot point.
- Do not touch the sprinkler pipe or its supporting structures when the system is operating under or parallel to and near a transmission line.
- Maintain the system with the sprinkler pipe perpendicular to the transmission line.

BPA has prepared a guideline for the installation and operation of irrigation systems near high-voltage transmission lines. A copy will be provided when you contact BPA's regional office for approval and assistance in safely locating, operating and maintaining irrigation systems near transmission lines.

Underground Pipes, Telephone Cables and Electric Cables

Underground pipes and cables are compatible with transmission lines providing installation and maintenance are properly done. However, they should be installed at an angle of 60 degrees or more to the transmission line centerline (a perpendicular crossing is best). Normally, pipes and cables should not be installed closer than 50 feet to a BPA structure or the buried grounding system. These systems are long buried wires that are sometimes attached to the structures and can run up to 300 feet along the right-of-way. Since these grounding systems are not visible above ground they must be located by BPA. Contact the nearest BPA regional office before installing any pipe or cable which crosses a BPA transmission line right-of-way.

Proper orientation of the line with respect to underground pipes, telephone cables and electric cables is required to prevent an accident in an extreme

